carrier frequency. As described in the specification, the water transforms the pulse into a narrow sonic beam.

Claim 1 was rejected as obvious over Neal (3,840,875) or Wilk (5,930,199) in view of Guigné (4,924,449). Neal describes a system for transmitting light or sound by energizing each of his transducers through a gate that results in pulses that are all of the same magnitude. His pulses are not modulated by a lower frequency. In addition, Neal uses the same detectors that generate sonic pulses to detect the echoes of those pulses (his column 4, lines 64-68), rather that at least one separate sound detector.

Wilk has transducers 28 that create sonic pulses and separate sensors 30 that detect echoes, although they are not interspersed. He does not suggest that the output of a transducer be at least 200 kHz or suggest that a high carrier frequency be modulated by a lower frequency, to create a narrow sonic beam in water.

Guigné suggests a carrier frequency that is modulated, but he suggests a carrier frequency of about 100 kHz or lower (his column 7, lines 43-49), which would not provide as narrow a sonic beam in water.

Thus, neither Neal nor Wilk, in combination with Guigné, suggest applicant's apparatus that energizes sonic transducers with a carrier frequency of at least 200 kHz and modulated by a lower frequency, to generate a narrow sonic beam in water.

Claim 2, which depends from claim 1, was rejected on the above three references and also on Thompson (H1490). Claim 2 describes the apparatus as including a vehicle constructed to tow the transducers along a path no more than six meters above the seafloor, and with the transducers facing downward. Thompson describes a system for detecting possible oil deposits deep under a seafloor. He generates seismic waves which are similar to acoustic waves only in that they produce pressure, but with seismic waves having frequencies orders of magnitude less than acoustic waves generated by applicant. He detects echoes by electromagnetic field sensors, as compared to a sonic detector. Thompson relates to a different technology of seismic research which detects formations deep under the seafloor, compared to applicant's sonic detectors which are orders of magnitude higher in frequency and which detect conditions at and close to the seafloor, and therefore Thompson describes

non-analogous technology.

Claim 3, which depends from claim 1, describes at least three detectors which are interspersed with the transducers that generate sonic beams. Neal uses the same transducers to transmit sonic energy as well as to detect it. As discussed in the application, applicant's separate detectors provide much higher sensitivity. Wilk describes transducers that create sonic energy and separate detectors, but does not describe the detectors interspersed with transducers and does not describe applicant's frequencies that result in narrow beams. Guigné describes an array of transducers that produce sonic energy and a receiver array, but does not describe them interspersed or describe applicant's higher carrier wave frequency which results in a narrower sonic beam.

Claim 4, which was rejected on Neal or Wilk in view of Guigné and Thompson, describes an array of sonic transducers and at least one sonic detector, and a vehicle that supports the array at not more than six meters above the seafloor, with the transducers energized one at a time to produce pulsed sonic beams. Thompson is the only reference which shows supporting detectors no more than six meters above the seafloor. However, his Fig. 1 shows that his seismic source 42 is proposed to lie close to the sea surface rather than close to the seafloor, and he suggests a single seismic source rather than an array which includes a row of such sources. Also, his energy source is a seismic source and he detects electromagnetic fields resulting from the seismic source, rather than suggesting at least one sonic detector that detects echoes of sonic energy rather than electromagnetic energy resulting from seismic waves.

Claim 5, which depends from claim 4, describes a row of sonic detectors extending parallel to the row of sonic transducers, with each sonic detector lying adjacent to a selected sonic transducer. Thompson's Fig. 1 shows that his detector does not lie adjacent to a row of sonic transducers that produce sonic beams.

Claim 8 describes an array that includes a plurality of transducers that each can generate a sonic beam and at least three detectors interspersed with the transducers, each transducer associated with an adjacent sonic detector. Applicant's Fig. 3 shows a detector 24 lying within a transducer 22 that generates a sonic beam. This

arrangement results in each detector being far more sensitive to the sonic echoes produced by its corresponding transducer than echoes produced by other transducers much further away. This allows all the transducers of the array to be rapidly pulsed one after another, with minimal possibility that a detector will detect pulses from a far away transducer.

Neal uses the same transducers to detect as to produce a sonic beam, because he does not use separate sonic detectors. Wilk uses transducers for creating sonic energy and separate detectors, but they are not interspersed. Guigné shows an array of transducers that produce sonic energy and a separate array that detects echoes. Thus, none of the references suggest applicant's provision of sonic detectors that are interspersed with transducers that produce sonic energy.

Claim 9, which depends from claim 8, describes the transducers energized with a carrier frequency of at least about 200 kHz and describes the transducers as spaced apart by at least about 3.5 cm and no more than 25 cm. Kosalos (5,200,931) states that the separation between transducers should be less than ½ wavelength (column 7, lines 3-8). For applicant's carrier frequency of 200 kHz, and a velocity of sound in water of 1480 meters per second, this results in a wavelength of 0.74 cm. According to Kosalos, this would require a spacing of transducers of no more than 0.37 cm. Applicant's spacing of the transducers by at least about 3.5 cm, would appear to violate Kosalos' statement of maximum spacing.

In view of the above, favorable reconsideration of the application is courteously requested. If the Examiner should wish to discuss the application, the Examiner is invited to call Leon D. Rosen at (310) 477-0578.

Respectfully submitted,

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